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(19) **United States**(12) **Patent Application Publication**  
**HSIEH**(10) **Pub. No.: US 2013/0092976 A1**(43) **Pub. Date: Apr. 18, 2013**(54) **A SEMICONDUCTOR POWER DEVICE  
INTEGRATED WITH IMPROVED GATE  
SOURCE ESD CLAMP DIODES****Publication Classification**(51) **Int. Cl.**  
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USPC ..... **257/133; 257/E27.02**(75) Inventor: **Fu-Yuan HSIEH**, New Taipei City  
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LTD.**, New Taipei City (TW)(57) **ABSTRACT**

A trench semiconductor power device integrated with four types of ESD clamp diodes for optimization of total perimeter of the ESD clamp diodes, wherein the ESD clamp diodes comprise multiple back to back Zener diodes with alternating doped regions of a first conductivity type next to a second conductivity type, wherein each of the doped regions has a closed ring structure.

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